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Educational Attainment in Developing Countries

New Estimates and Projections Disaggregated by Gender

*Vinod Ahuja**Deon Filmer*

Expectations are that educational attainment will grow most in the Middle East and North Africa and least in Sub-Saharan Africa. It should improve greatly in South Asia where the level of attainment is lowest. The gender gap in education may have risen in the past decade. This trend will continue unless countries intensify their efforts to educate girls.

Background paper for World Development Report 1995

The World Bank
Office of the Vice President
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Summary findings

Ahuja and Filmer present new estimates of educational attainment in 71 developing countries for the years 1985, 1990, and 1995. They also project levels of educational attainment through the year 2020 by using the United Nations Educational, Scientific, and Cultural Organization's projections of enrollment and the International Labour Organization's projections of population by age and sex.

The projections suggest interesting trends:

- Growth of stock in human capital is expected to be highest in the Middle East and North Africa and lowest

in Sub-Saharan Africa.

- South Asia — currently the least educated part of the world — is expected to substantially augment its stock of human capital by the year 2020.

- In most regions, enrollment levels are expected to remain lower for girls than for boys.

- The gender gap in education may have risen in the past decade. This trend toward a widening of the gender gap may continue unless countries intensify their efforts to educate girls.

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Educational Attainment in Developing Countries: New Estimates and Projections Disaggregated by Gender

A Background Paper for the World Development Report 1995

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EDUCATIONAL ATTAINMENT IN DEVELOPING COUNTRIES : NEW ESTIMATES AND PROJECTIONS DISAGGREGATED BY GENDER

Vinod Ahuja and Deon Filmer

Human capital has come to be regarded as the primary source of long term economic growth along with physical capital (Azariadis and Drazen, 1990; Barro, 1991; Mankiw, Romer, and Weil, 1992). However, most of the empirical studies of growth have relied on measures of the accumulation of human capital such as enrollment ratios, or proxies of the stock such as illiteracy rates (Romer, 1989; Mankiw, Romer and Weil, 1992). Inadequacy of these indicators to represent the stock of human capital embodied in the population needs no explanation. Lack of data on appropriate measures of human capital stock has been the main motivation for recent studies attempting to estimate the level and distribution of the global stock of human capital across countries (Barro and Lee, 1993; Nehru, Swanson and Dubey, 1993; Dubey and King, 1994, Psacharopoulos and Arrigada, 1986 and 1992; Kyriacou, 1991).

While these studies have, to some extent, narrowed the knowledge gap, the estimates presented in these studies suffer from several shortcomings. For example, Barro and Lee (BL) estimate the proportions of the population with primary, secondary and higher education. But, their estimates pertain to individuals aged 25 years and above. Thus, their estimates do not reflect the enormous expansion of education that has occurred in the developing countries since 1960. Nehru, Swanson and Dubey (NSD) construct the estimates of mean schooling (years) at primary, secondary, and tertiary levels for the working age population but their estimates are not disaggregated by sex. Dubey and King (DK), estimate

mean school years disaggregated by sex and age groups, but because of data limitations they drop the higher education category. In addition, the latest available year in these studies is 1987. Although stocks of human capital change slowly, recent rapid expansion of education implies relatively large changes which need to be considered. Because of these reasons, this paper, (i) presents new estimates of educational attainment for the years 1990 and 1995, (ii) quinquennially projects these estimates until the year 2020, and (iii) updates BL's estimates for 1985 by including the stock of human capital embodied in individuals below 25 years.

Methodology

The main procedure for constructing human capital stock in the previous studies has been the 'perpetual inventory' method. This method requires very long data series on enrollments, repeaters and dropouts. For example, for constructing human capital stock in 1990 the perpetual inventory method would require data starting at least 1925. But, available data series on enrollments, repeaters and drop outs do not go that far back in time. The analysts are thus forced to backcast these series which introduces errors in their estimates. In order to avoid that problem, we use somewhat different methodology described below.

Because long data series are needed to estimate the educational achievements of adult population only, we obviate the need to use them by dividing the population into two broad groups: adults (those aged 25 years and more) and youngsters (those between 6 and 24 years), and using BL's estimates of educational achievements for adult population for the base year. Since their estimates combine census/survey data¹ and estimates based on these as benchmark, we believe that using their estimates as the base for educational achievements

¹ Approximately 40 percent observations in BL dataset are obtained from available censuses and survey estimates of educational achievements from various UNESCO publications.

of adult population minimizes the potential error that may be introduced by using perpetual inventory method.

By combining BL's estimates with the estimate of educational achievements for youngsters, we obtain the educational attainment of the population between 6 and 60 years (excluding those currently in school) across primary, secondary, and tertiary educational levels. The no education category is the residual. These new estimates for 1985 form the 'base' for our estimates in 1990 and 1995 and projections thereafter. From 1985 onwards we perform the 'stock-flow' analysis. That is, we follow each age cohort year after year and, after adjusting for age and gender specific mortality rates, recompute the proportion of population across no schooling, primary, secondary, and tertiary schooling categories.

In order to estimate the educational achievement of youngsters in the base year, we use age and gender specific enrollment rates at each educational level. Let Y_{jt} be the young population (less than or equal to 24 years) in j^{th} age-cohort where $j=1,2,3$ corresponds to 6-11, 12-17, and 18-24 years age categories in t^{th} time period. Further, let E_{kt} be the enrollment rates at k^{th} education level in t^{th} time period where $k=1,2,3$ corresponds to primary, secondary, and tertiary levels. The number of students enrolled at each level at time t is then given by

$$S_{jkt} = Y_{jt} * E_{kt} \quad \text{for } j = k.$$

where S_{jkt} = the number of students at k^{th} educational level at time t .²

To estimate the educational achievement of youngsters not in school at time t (number of individuals in age cohort 2 who dropped out of school after primary education,

² Since this population has not yet completed its educational achievement we do not count them as part of the stock.

and the number of individuals in age cohort 3 who dropped out of school after primary or secondary education) we follow the age cohorts who entered the educational system 6 and 12 years prior to time t . Since we have estimates of those in school at time t , the number of individuals who dropped out of school after primary and secondary education can be easily estimated.

Finally, for 1990 and 1995 we decompose the estimates for four categories into six categories: no schooling, primary incomplete, primary complete, secondary incomplete, secondary complete, and some tertiary using the available drop-out rates for 1985 and 1990. We do not decompose the tertiary education category into complete-incomplete because of non-availability of drop-out rates at this level. Also, the projections beyond 1995 are not decomposed into complete-incomplete categories because of our unwillingness to hazard a guess about the behavior of drop-out rates in the future.

The data

This section describes the source of each data series and presents a regional overview of some of the educational indicators.

1. Educational composition of adult population

As noted before, this data is obtained from BL. They provide estimates of the distribution of adult population for seven educational categories: no schooling, primary incomplete, primary complete, secondary incomplete, secondary complete, higher incomplete, and higher complete for the years 1960-85. For 1985, this data is available for 106 countries. However, out of these, 25 are OECD countries. Since the availability of enrollment projections is limited to developing countries, these 25 countries are excluded.

This leaves us with 81 developing countries. A regional summary of the educational attainment of adult population is presented in Table 1.

Table 1: Educational attainment of adult population: 1985

Region	Percent of adult population with				Mean Schooling (Years)
	No schooling	Some primary schooling	Some secondary schooling	Some higher schooling	
East Asia and the Pacific	23.6	51.3	18.8	6.3	5.19
Latin America and the Caribbean	22.4	56.6	13.9	7.1	4.47
Middle East and North Africa	52.8	26.5	16.0	4.8	3.51
OECD	3.3	37.7	40.8	18.2	8.88
South Asia	69.0	13.7	14.1	3.2	2.49
Sub Saharan Africa	48.1	41.7	9.3	1.0	2.67

Source : Barro and Lee, 1993.

2. Population

Age and gender specific population estimates and projections are obtained from ILO (1986) and subsequent ILO data updates. In order to combine UNESCO provided enrollment ratios and BL attainment statistics, and apply the stock-flow model of educational projections, the population data are modified as described below.

First, the age breakdown is redefined so that net enrollment ratios can be applied to the appropriate age groups. ILO population data are broken down into nine, five year age groups between 10 and 64 (i.e. 10-14, 15-19, ...), ages 0 to 9, and a group of those 65 and above. These are reshaped by assuming: (1) the size of the age cohort aged 5 to 9 in a given year is equal to the size of the same cohort when aged 10 to 14 (i.e. five years later) and (2) the age distribution within each five year cohort in a given year is uniform. Using these simplifying assumptions, the data are transformed into population data for ten, six year age groups (i.e. 0-5, 6-11, ..) between 0 and 59, and those 60 and above.

Second, the years need to be redefined in order to be able to carry out the stock-flow model of educational attainment. ILO data are estimated and projected for every five years until 2025. Data for intervening years are imputed by applying the average annual growth rate for each age cohort over the five years to the stock in the base year.

3. Enrollment rates, repetition rates, and drop out rates

The gender specific gross enrollment ratios for years before 1990 are obtained from the Economic and Social Database of the World Bank (BESD). The projections of enrollments are from UNESCO (1993). This publication presents decennial projections of gross enrollment ratios at 1st, 2nd, and 3rd level of education for 107 developing countries. The projections for the intervening years are derived by log-linear interpolations. Finally, after combining this data with BL dataset, and retaining only those countries for which data is available in both data sets, we are left with 71 countries³⁴. Appendix 1 lists the countries included in the analysis.

The repeat rates for primary and secondary school are derived from UNESCO data on the number of students enrolled at each level and among those, the number who have repeated a grade. Using the available data, a simple imputation and projection model is used to fill in data for between 1960 and 2020⁵. If there is no data for a country, no adjustment is made. If there is only one observation, this is assumed to be the repeater rate. If there is more than one observation for a country, the annual average growth rate for the repeat rate is used to infer missing data and project these rates to 2020. Since the rates can vary greatly

³ BL dataset does not contain estimates for China. For China the distribution in the base year is obtained from Chinese Social Statistics Publisher (1993). However, the disaggregation across gender could not be available. Thus, China's estimates and projections are not disaggregated by gender.

⁴ Combined together these countries account for over 80 percent population of non-OECD countries.

⁵ See Appendix 2 for the countries and time periods for which data on repeat rates is available.

(even from one year to the next), some of these growth rates imply what may be implausible values. Therefore, data on repeat rates are constrained from below by the value at the 10th percentile, and from above by the value at the 90th percentile. Using these repeat rates, we adjust the gross enrollment ratios including the projections. The adjusted gross enrollment ratios are then used in further estimations and projections. Except for Sub-Saharan Africa (SSA), all regions seem to have made significant progress in expanding the coverage of primary and secondary education (Figures 1A-1C and Figure 2)⁶. In SSA, primary enrollments are still much below 100 per cent and have already started declining. Further, UNESCO has projected continuation of these declining trends at all educational levels.

Drop out rates are constructed using data on enrollment and repeat levels for each grade within the educational attainment categories. Denoting NE_{ij} as the net enrollments at grade j in year t , the drop out rate at grade j is given by

$$D_{ij} = (NE_{i+1j+1} - NE_{ij}) / NE_{ij}$$

These grade specific drop-out rates are then used to calculate the overall drop out rate at each educational level⁷. The drop-out rates at the regional level for 1985 and 1990 are presented in Figures 3 and 4. These drop-out rates may appear high but are consistent with the regional drop-out rates reported elsewhere (see, for example, Chowdhary, 1995; UNESCO, 1984).

⁶ The trends presented in Figures 1A-1C and Figure 2 are computed using the data for 71 countries in our sample.

⁷ The data used to construct the drop out rates were obtained from BESD. It should be noted however that these data are scarce specially at the secondary level. For secondary level, therefore the decomposition across complete-incomplete categories is based on limited data and should be used with caution.

Figure 1A: Gross Enrolment Ratios (adjusted for repeaters) at the Primary Level : Trends and Projections

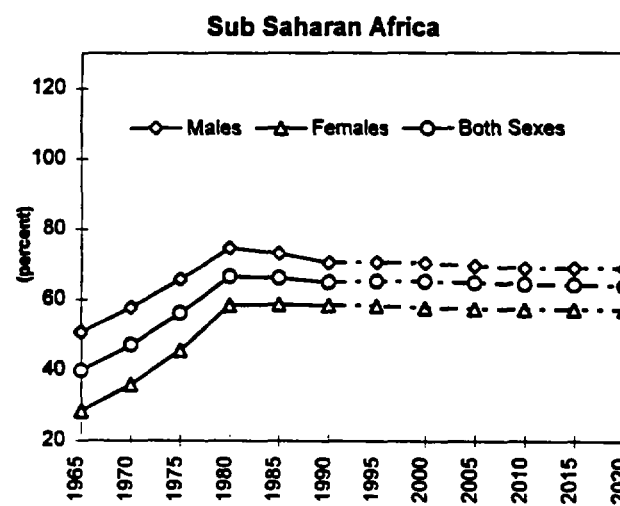
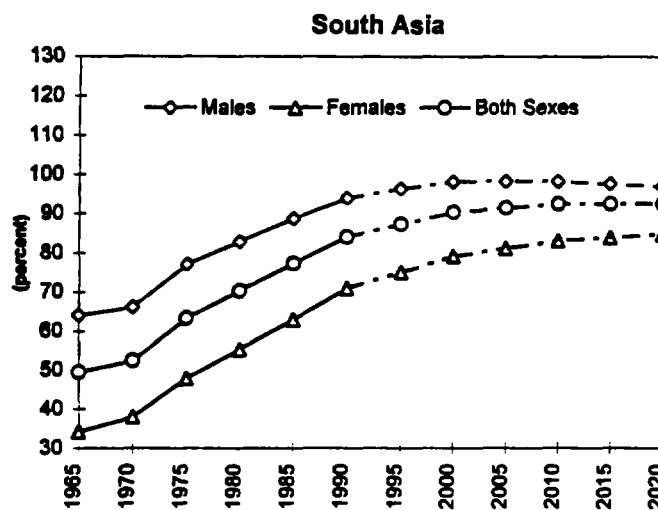
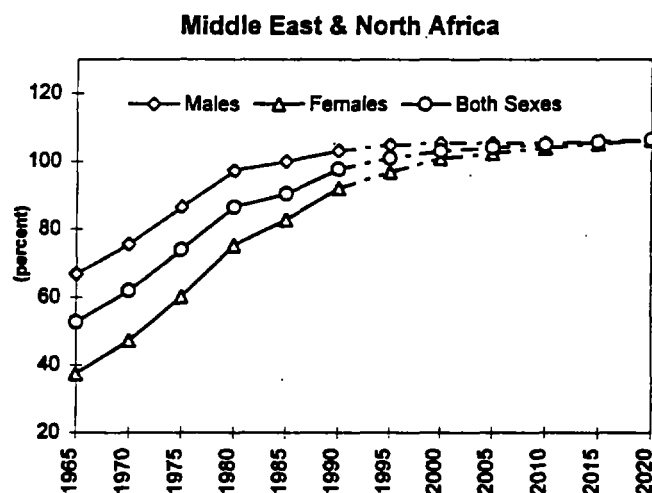
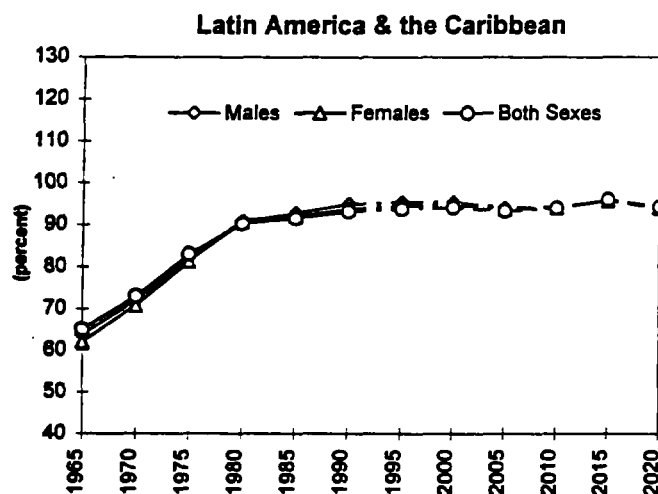
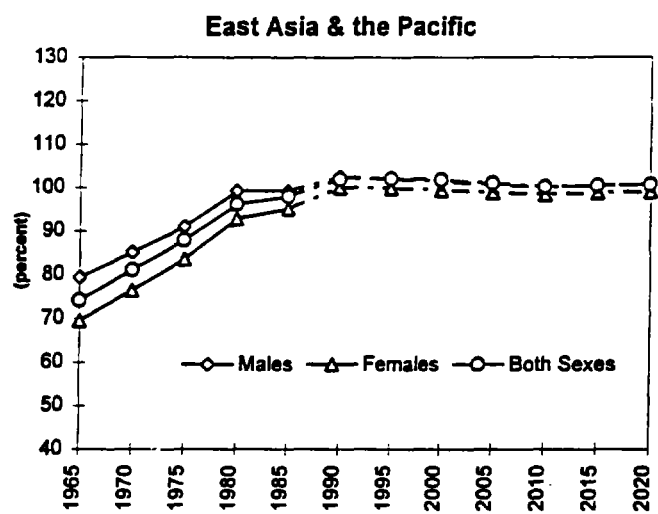
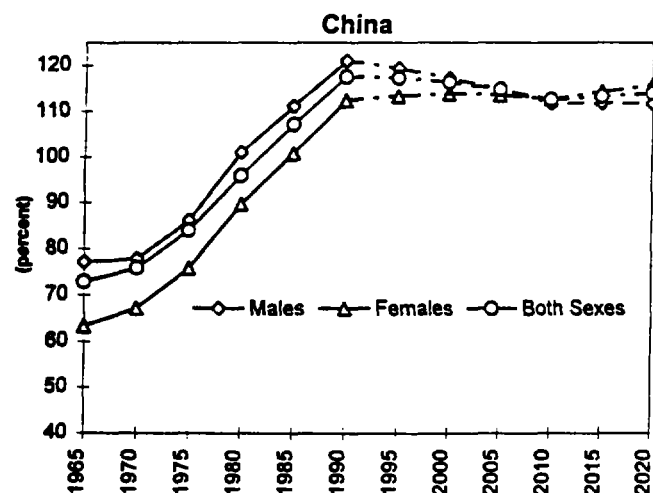


Figure 1B: Gross Enrolment Ratios (adjusted for repeaters) at the Secondary Level : Trends and Projections

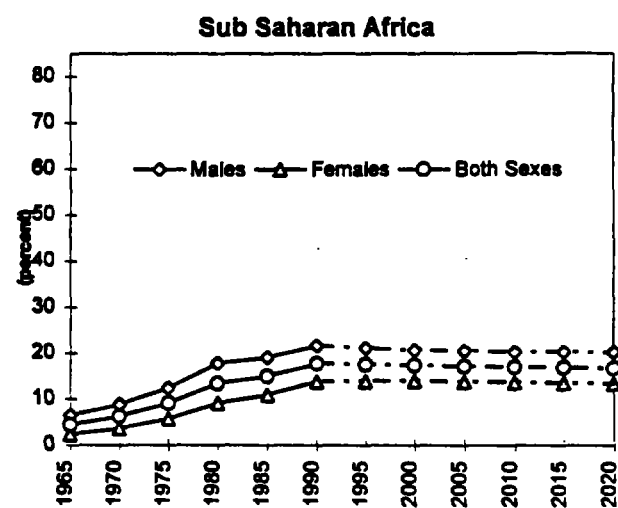
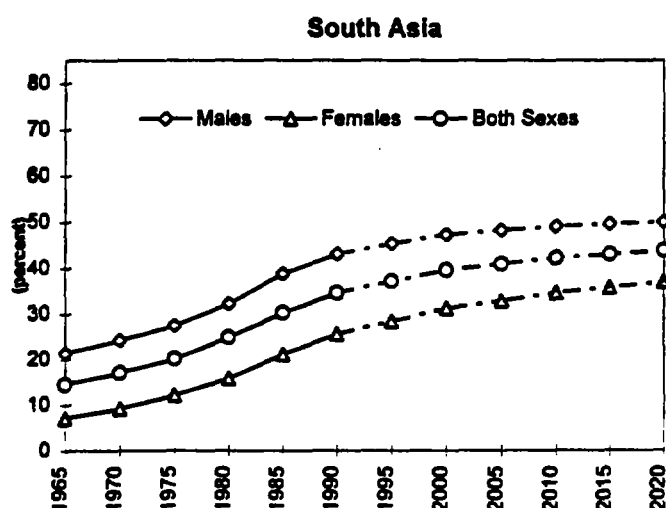
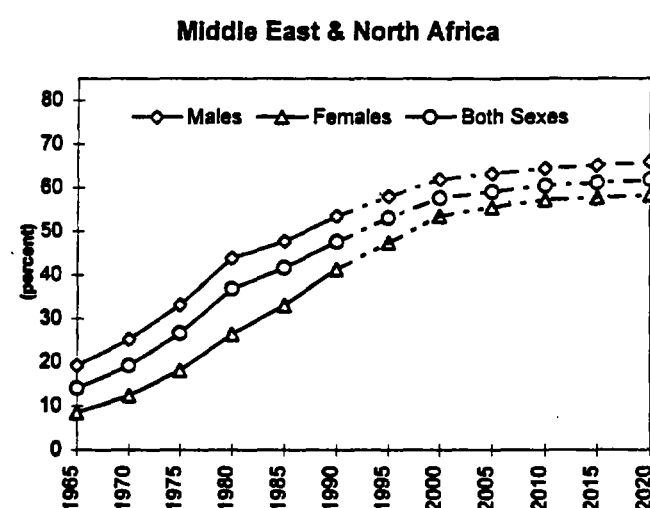
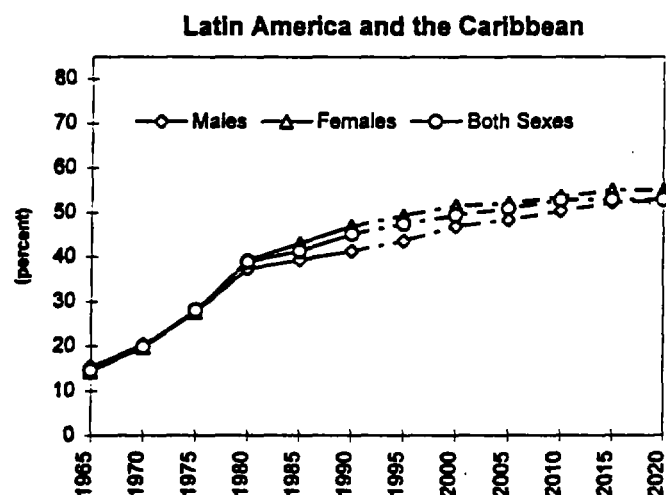
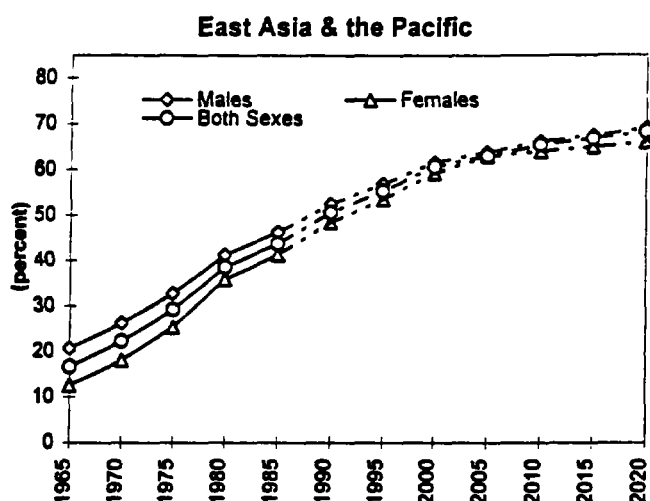
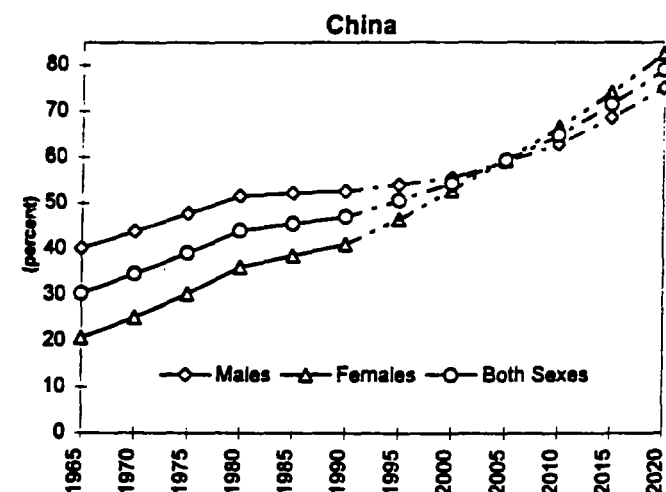


Figure 1C: Gross Enrolment Ratios at the Tertiary Level : Trends and Projections

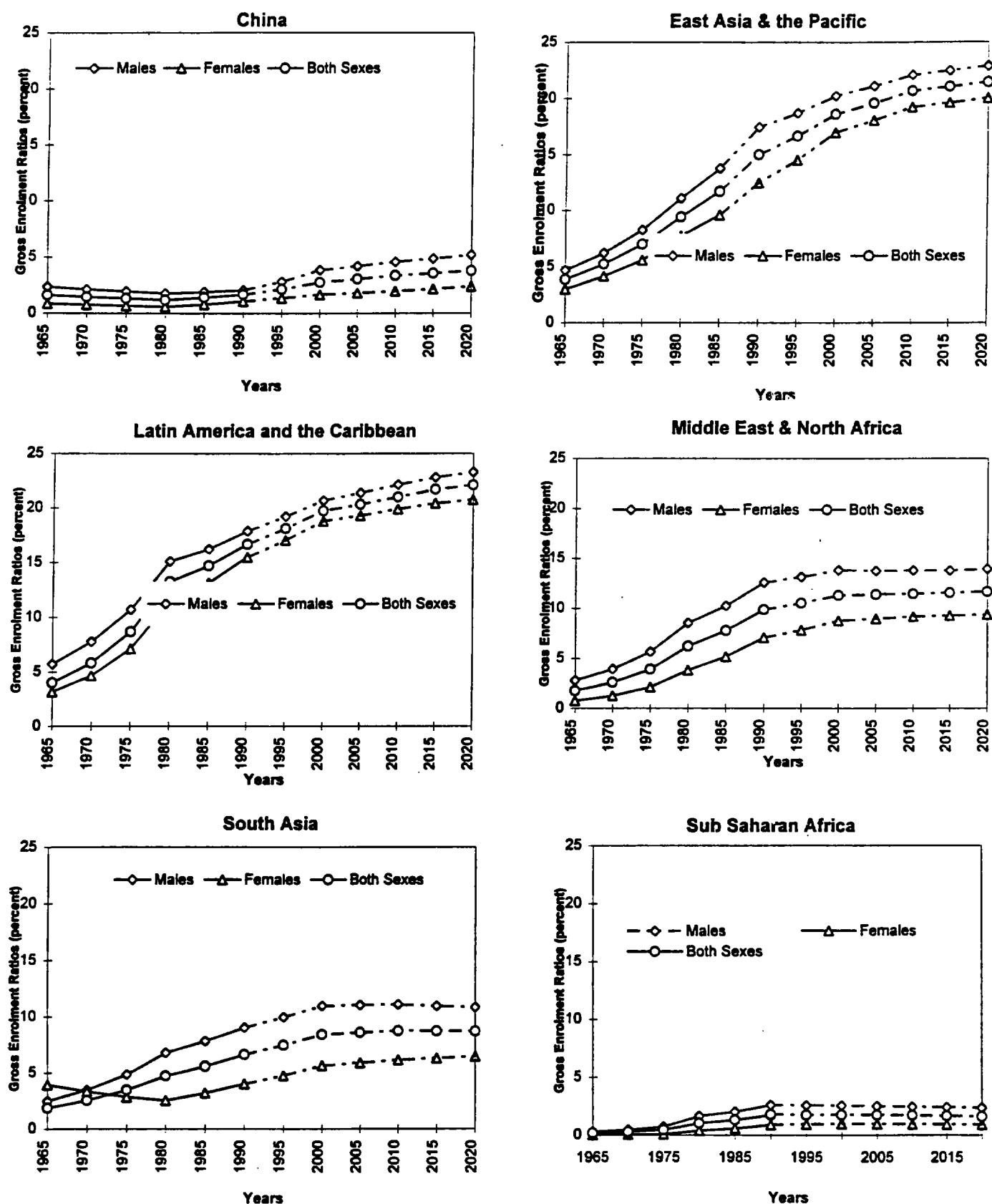


Figure 2: Repeat Rates at Primary and Secondary Levels

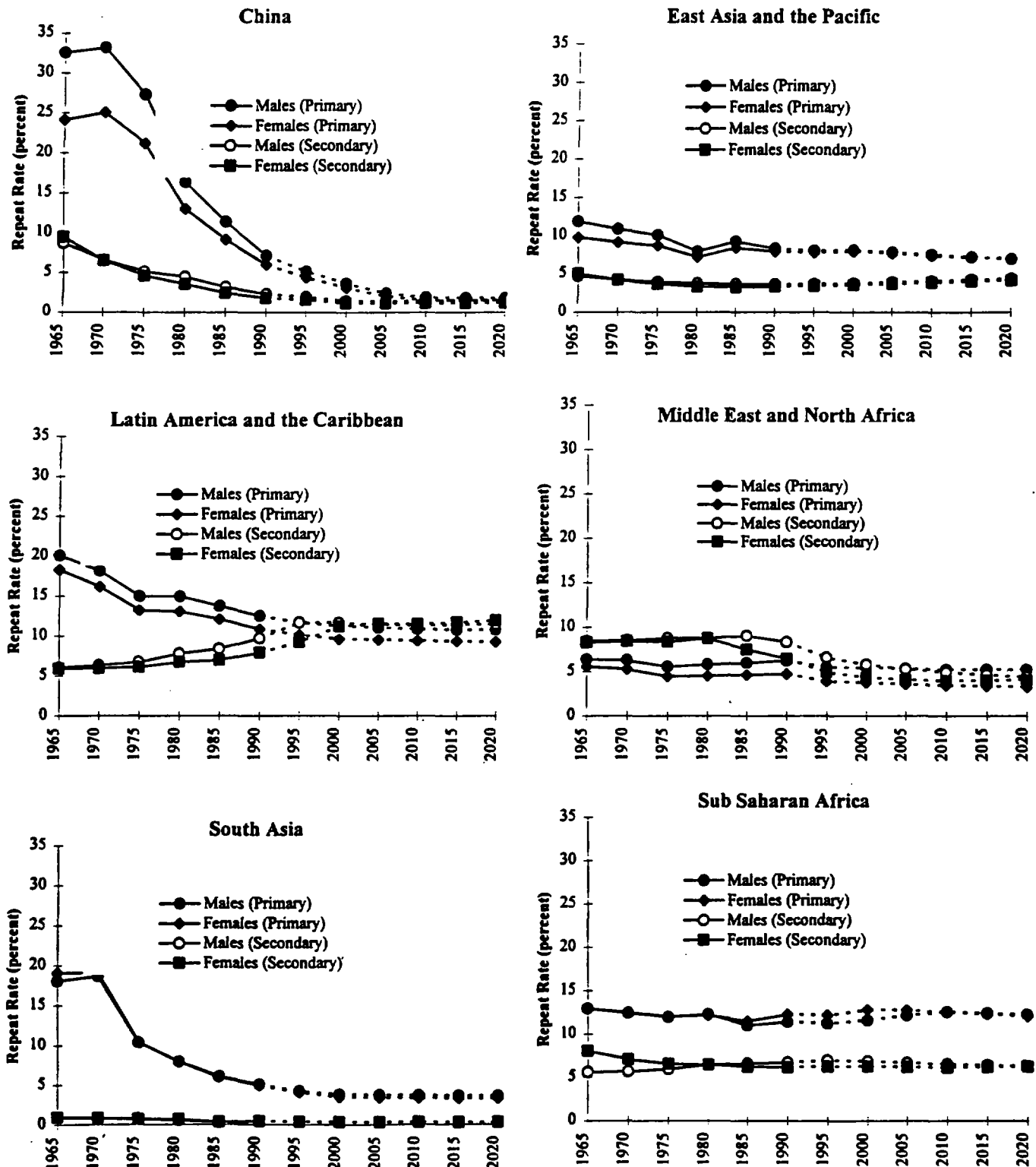


Figure 3

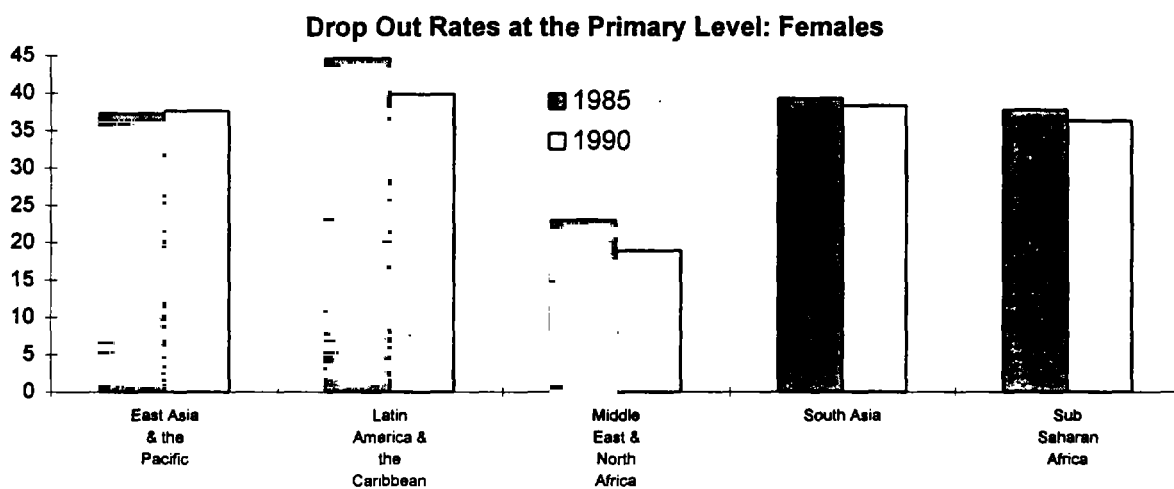
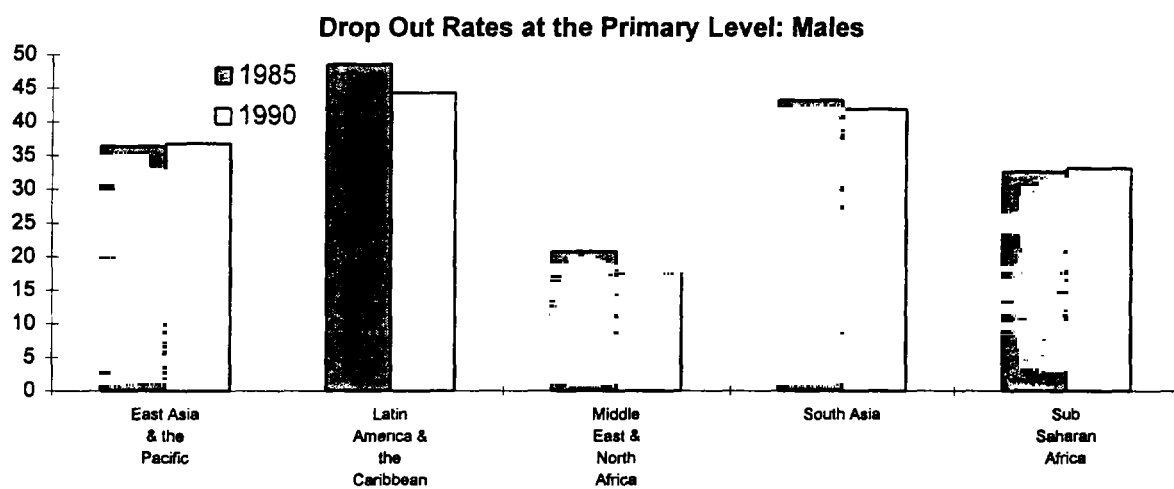
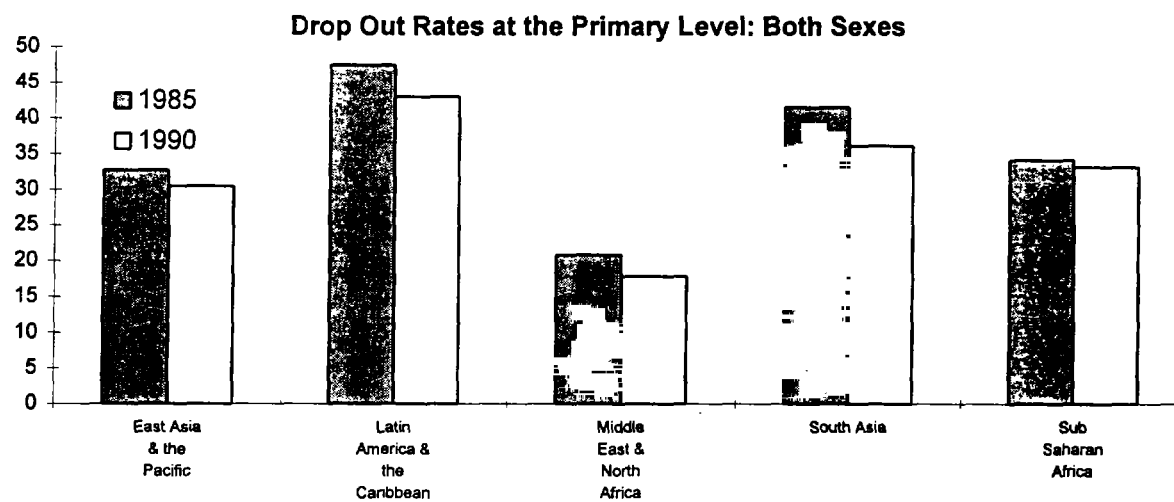
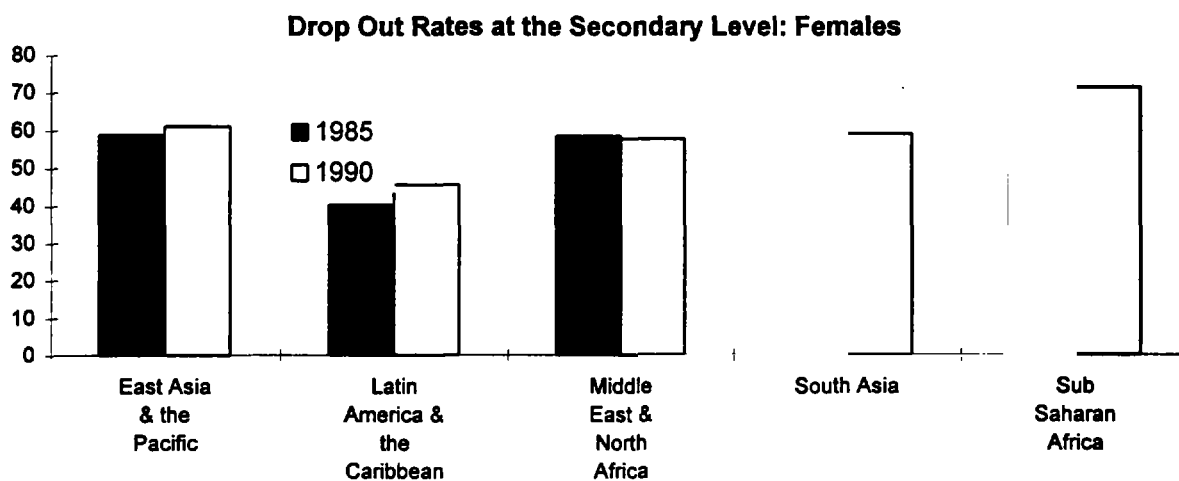
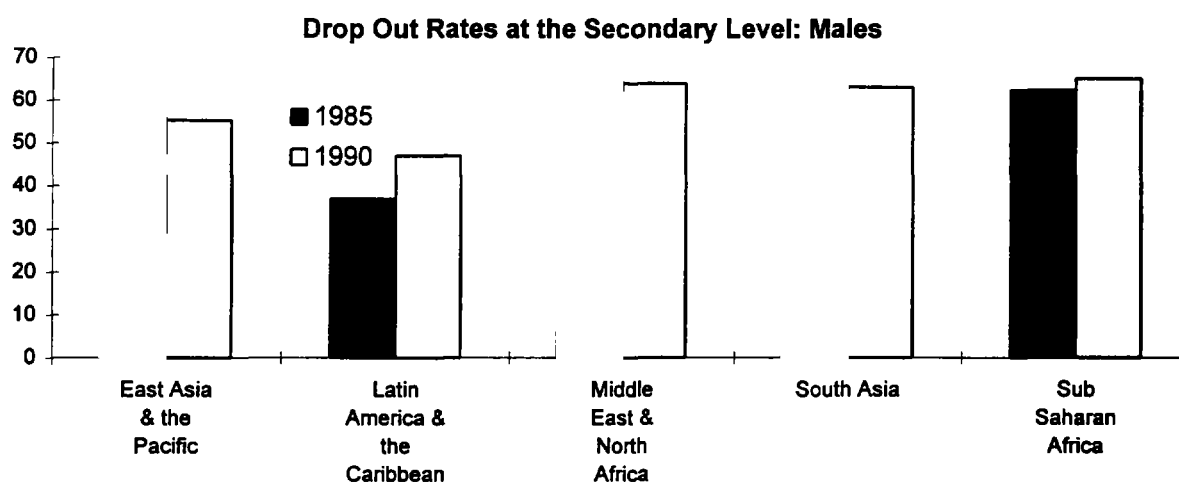
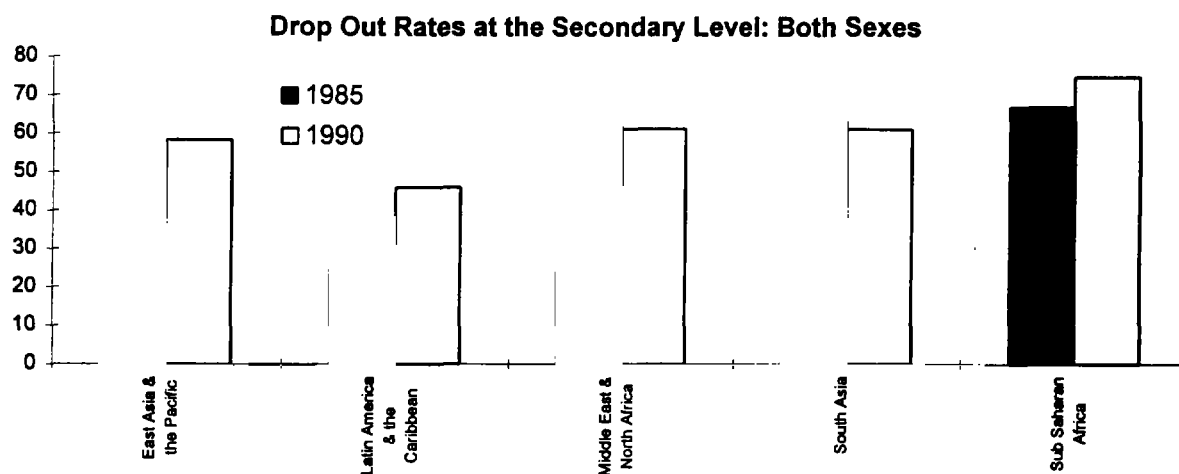


Figure 4



Like previous studies attempting to estimate the education stock, this study also had to deal with several methodological and data problems. Wherever feasible, we have attempted to minimize the use of assumptions and extrapolations. Nevertheless, the results are subject to a number of caveats.

The first issue is that of measurement error in the raw data. In the literature there has been some concern that for some countries UNESCO's data may contain significant measurement error which, in turn, would influence the stock estimates (for a discussion of this issue, see Jimenez, 1994). To the extent that UNESCO's data on enrollments and repeaters and BL's estimates of stock for the base year may be influenced by the measurement error, the bias would also be reflected in our estimates.

Second, like previous studies, we had no alternative but to ignore the fact that age ranges for various educational levels are not necessarily uniform across countries although in our sample the differences are not wide.

Third, the estimates do not account for the differences in quality of education across countries. While we recognize the importance of quality of education, the fact that quality is a multi-dimensional concept and no single indicator is available to represent this variable it is nearly impossible to adjust the estimates for the quality of education⁸. Similar is the case of non-schooling education such as 'on the job training' etc.

Finally, the estimates beyond 1995 are merely 'projections' of educational attainment and should not be interpreted as the 'forecasts'. A forecast model has to take into account the

⁸ Some previous studies have used teacher-pupil ratio as a proxy for quality of education. Once again, this variable does not reflect the phenomena such as absenteeism (not only of pupils but also that of teachers) which is not uncommon in the developing countries.

effects of several economic variables such as returns to education, direct and indirect costs of education, and the policy variables such as public provision of resources for education, etc. Our estimates, on the other hand, simply reflect (i) the effects of demographics, and (ii) UNSECO's projections of enrollment levels. It may be noted, however, that the effect of demographics is expected to be very strong especially in the regions with low educational levels such as South Asia (SA) and SSA. That is simply because the educational gap between younger and older age cohorts in these regions is wide and thus, when the older age cohorts retire and younger age cohorts move into adult population the educational level of the population is bound to rise significantly even if these regions fall short of the enrollment levels projected by the UNESCO.

Results

The country level estimates are presented in an Appendix which is not included as part of this paper due to space limitations. An electronic copy of the appendix can be obtained from the authors. In this section we confine our attention to the regional level estimates.

Before presenting the results, however, it is important to provide some indication of the reliability and the quality of estimates. We do this by comparing our estimates with the estimates in previous studies for the year 1985.

The estimates obtained in this study show very high correlation with BL's estimates⁹. That is, however, no surprise because we used BL's estimates as the base case for educational attainment of adult population. However, our estimates of educational levels are

⁹ All correlation coefficients greater than 0.9.

higher than BL's estimates because younger age cohorts are generally more educated. In order to compare our estimates with those of NSD, DK, and Kyriacou, we estimated the mean schooling levels (years) by assigning half the number of years in the educational cycle to those who did not complete the cycle. The resulting estimates of mean schooling at the regional level are presented in Table 2. These estimates show high correlation with the estimates of NSD, DK and Kyriacou (Table 3). Since we have used a different methodology than the previous studies, such high correlation of our estimates with those in previous studies reinforces our confidence in the new estimates and projections.

Table 2: Estimated Mean Schooling Levels

(years)

Regions	BL's estimates	Our estimates		
	1985	1985	1990	1995
Both Sexes				
China		5.3	5.3	5.6
East Asia & the Pacific	5.2	5.8	6.3	6.9
Latin America & the Caribbean	4.9	5.3	5.9	6.4
Middle East & North Africa	3.6	4.6	5.3	6.2
South Asia	2.4	3.4	3.9	4.3
Sub Saharan Africa	2.1	3.0	3.5	4.0
Females				
East Asia & the Pacific	4.5	5.6	6.0	6.4
Latin America & the Caribbean	4.7	5.3	5.8	6.3
Middle East & North Africa	2.7	4.6	5.1	5.8
South Asia	1.6	3.1	3.4	3.7
Sub Saharan Africa	1.4	2.8	3.1	3.5
Males				
East Asia & the Pacific	5.8	5.8	6.1	6.8
Latin America & the Caribbean	5.1	5.2	5.8	6.3
Middle East & North Africa	4.4	4.7	5.5	6.4
South Asia	3.1	3.5	4.1	4.7
Sub Saharan Africa	2.8	3.2	3.7	4.3

Table 3: Correlation coefficient of mean schooling with estimates in other studies

	This study	BL	NSD	DK	Kyriacou
Both sexes					
<i>This study</i>	1.00	..	..	..	..
<i>BL</i>	0.95	1.00	..	..	..
<i>NSD</i>	0.92	0.91	1.00	..	..
<i>DK</i>	0.88	0.81	0.92	1.00	..
<i>Kyriacou</i>	0.88	0.89	0.88	0.79	1.00
Females					
<i>This study</i>	1.00	..	..	..	..
<i>BL</i>	0.94	1.00	..	..	..
<i>DK</i>	0.91	0.88	..	1.00	..
Males					
<i>This study</i>	1.00	..	..	..	..
<i>BL</i>	0.94	1.00	..	..	..
<i>DK</i>	0.81	0.72	..	1.00	..

Note: All correlation coefficients significant at 1 percent level.

According to our estimates, all regions have made significant progress in augmenting the educational attainment of population (Table 4). The highest gain appears to be in the Middle East and North Africa (MENA) region where primary enrollment ratio is close to 100 percent, and post primary enrollments are also quite high¹⁰. If the countries in MENA achieve the enrollment levels projected by the UNESCO, MENA region would emerge as one of the highly educated regions amongst the developing countries with the proportion of population with no schooling falling below 1 percent and the proportion of population with at least some secondary education exceeding 50 percent by the year 2020 (Table 5). On the other hand, the least educated region is SA where more than 50 percent population had no schooling in 1985. SA is closely followed by SSA where the comparable figure was nearly

¹⁰ The two major MENA countries missing from the sample are Egypt and Morocco. In Egypt, which accounts for nearly 25 percent of the regional population, the enrollment ratios at all level are relatively high and rising. In Morocco, which accounts for another 10 percent of population, the enrollment ratios are low and stagnating. Inclusion of Morocco in the sample would, therefore, somewhat diminish the estimates and projections for MENA.

40 percent. During the last decade, however, the enrollments ratios in SA have increased steadily and the primary enrollment ratio was close to 100 percent in 1995. As a result, the proportion of population with no schooling in SA fell by more than 18 percent points during 1985-95. In contrast to that the primary enrollment ratios in SSA are much below 100 percent and are declining. Thus, the fall in proportion of population with no schooling was only about 12 percent points. If these trends continue, the education map of the developing regions could significantly alter during the next 25 years (Table 5).

Table 4: Estimates of Educational Attainment at Regional Level: Both Sexes

Region	Proportion of population under 60 years (not in school) with					
	No Schooling	Primary Schooling		Secondary Schooling		Higher Schooling
		Complete	Incomplete	Complete	Incomplete	
Year = 1985						
China	22.8	22.5	22.6	31.1		0.9
East Asia & the Pacific	16.7	35.3	25.5	9.0	9.3	4.1
Latin America & the Caribbean	16.7	20.8	42.3	6.8	8.5	4.9
Middle East & North Africa	37.6	26.4	16.6	8.0	9.0	2.4
South Asia	50.6	15.0	16.9	6.0	8.9	2.4
Sub Saharan Africa	39.3	24.2	29.7	1.3	5.0	0.5
Year = 1990						
China	21.8	22.7	23.0	31.5		0.9
East Asia & the Pacific	12.4	37.4	23.1	10.4	10.9	5.6
Latin America & the Caribbean	13.4	23.6	38.7	7.9	9.7	6.6
Middle East & North Africa	28.9	32.3	15.0	9.0	11.5	3.2
South Asia	41.1	19.5	19.3	7.5	9.6	2.9
Sub Saharan Africa	33.5	29.9	28.0	1.9	6.2	0.6
Year = 1995						
China	18.4	23.8	24.1	32.6		1.0
East Asia & the Pacific	7.3	39.1	20.5	12.3	13.1	7.6
Latin America & the Caribbean	9.3	25.4	36.6	9.1	11.1	8.5
Middle East & North Africa	19.7	37.7	14.1	10.3	14.0	4.3
South Asia	32.4	23.0	21.6	8.9	10.4	3.6
Sub Saharan Africa	26.9	35.2	27.0	2.5	7.6	0.8

Table 5: Projections of Educational Attainment at the Regional Level: Both Sexes

Region	Proportion of population under 60 years (not in school) with			
	No schooling	Some primary schooling	Some secondary schooling	Some higher schooling
Year=2000				
China	15.1	49.6	34.1	1.2
East Asia and the Pacific	6.2	57.4	27.4	9.0
Latin America & the Caribbean	7.4	59.6	22.6	10.4
Middle East & North Africa	12.0	54.3	28.4	5.3
South Asia	28.1	47.1	20.8	4.0
Sub Saharan Africa	22.2	65.1	11.7	0.9
Year=2005				
China	10.5	51.8	36.4	1.3
East Asia and the Pacific	2.5	55.4	31.1	10.9
Latin America & the Caribbean	5.9	56.4	25.3	12.3
Middle East & North Africa	4.6	55.9	33.1	6.3
South Asia	21.0	51.1	23.1	4.7
Sub Saharan Africa	19.2	66.7	13.0	1.1
Year=2010				
China	6.8	52.2	39.4	1.5
East Asia and the Pacific	2.0	50.7	34.5	12.8
Latin America & the Caribbean	5.9	52.6	27.4	14.0
Middle East & North Africa	0.7	55.1	37.0	7.2
South Asia	15.3	54.3	25.1	5.3
Sub Saharan Africa	17.1	67.7	14.0	1.2
Year=2015				
China	2.4	51.8	43.9	1.8
East Asia and the Pacific	1.4	45.6	38.1	14.8
Latin America & the Caribbean	5.7	48.9	29.7	15.8
Middle East & North Africa	0.2	51.1	40.7	8.0
South Asia	9.2	57.3	27.5	5.9
Sub Saharan Africa	15.9	67.9	14.9	1.3
Year=2020				
China	2.3	49.9	45.7	2.1
East Asia and the Pacific	1.7	42.2	40.0	16.0
Latin America & the Caribbean	6.1	46.6	30.6	16.7
Middle East & North Africa	0.2	48.3	43.0	8.4
South Asia	9.2	55.3	29.2	6.3
Sub Saharan Africa	16.2	67.3	15.2	1.3

While overall level of human capital stock in the developing countries have increased significantly, its distribution across gender has been far from uniform. In all regions except Latin America and the Caribbean (LAC), female primary enrollments continue to be lower than those of males although East Asia & the Pacific (EAP) and MENA have made significant progress in that respect. As a result of female enrollments falling short of males, the gender gap in education seems to have widened during the last decade. For example, in SA, the proportion of males with no schooling declined by more than 20 percent points during 1985-95 compared to less than 14 percent for females. Comparable figures for EAP, MENA, and SSA were 11 and 8, 21 and 15, and 15 and 9 percent points, respectively (Tables 6 and 7). Further, the expansion of post primary education has also been disproportionate. During 1985-95, the proportion of males with post primary education increased significantly faster than that of females in all regions. Also, UNESCO's projections suggest that (i) female enrollments at the primary level will continue to be lower than male enrollments in SA and SSA, and (ii) at the post primary level the female enrollments will be lower than male enrollments in all regions. In view of the recent research finding that (i) the social benefits of reducing the gender gap in education are large (World Bank, 1991; King and Hill, 1993), and (ii) the effect of female secondary education on social indicators such as fertility rate and infant mortality rate are very strong (Subbarao and Raney, 1993; see also Figures 5 & 6), the widening of the gender gap is a source of concern.

Conclusions

This paper has presented new estimates of educational attainment in 71 developing countries for the years 1985, 1990, and 1995. For 1985, our estimates compare well with

other available estimates. Since no estimates of human capital stock are available for 1990 and beyond, we could not perform any comparative analysis for those years. However, these estimates relate very well with other indicators of social and economic development such as GNP per capita, fertility rate and infant mortality rate. This reinforces our confidence in the new estimates.

The paper also projects the levels of educational attainment until the year 2020 by using UNESCO's projections of enrollments and ILO's projections of population by age and sex. The projections uncover some interesting trends. For example, growth in stock of human capital is expected to be highest in MENA and lowest in SSA. SA, which is currently the least educated region, is expected to substantially augment its stock of human capital by the year 2020. The findings also suggest that the gender gap in education may have risen during the last decade. Since in most regions the female enrollment levels are expected to continue to be lower than those for males, the trend in widening of gender gap may continue unless countries intensify their efforts in educating girls.

Table 6: Estimates of Educational Attainment at Regional Level: Females

Region	Proportion of population under 60 years (not in school) with					
	No Schooling	Primary Schooling		Secondary Schooling		Higher Schooling
		Complete	Incomplete	Complete	Incomplete	
Year = 1985						
East Asia & the Pacific	17.0	22.3	38.3	8.6	9.6	4.1
Latin America & the Caribbean	16.8	18.4	45.4	7.0	7.5	5.0
Middle East & North Africa	39.5	23.9	18.5	7.7	7.8	2.5
South Asia	53.4	13.5	16.4	5.4	8.7	2.6
Sub Saharan Africa	41.3	20.2	32.3	1.4	4.3	0.5
Year = 1990						
East Asia & the Pacific	13.5	20.5	39.7	8.6	12.6	6.7
Latin America & the Caribbean	14.3	20.4	40.5	6.6	12.0	6.3
Middle East & North Africa	32.9	31.0	15.2	7.7	10.3	2.8
South Asia	46.6	16.8	19.0	6.1	8.8	2.8
Sub Saharan Africa	37.5	24.7	30.0	1.2	5.6	0.5
Year = 1995						
East Asia & the Pacific	8.9	19.2	40.0	9.1	16.0	6.7
Latin America & the Caribbean	10.2	21.5	38.9	5.8	15.7	7.9
Middle East & North Africa	24.4	36.7	13.9	8.1	13.5	3.4
South Asia	39.7	19.8	21.4	6.9	9.3	2.8
Sub Saharan Africa	32.2	28.9	30.0	1.0	7.3	0.5

Table 7: Estimates of Educational Attainment at Regional Level: Males

Region	Proportion of population under 60 years (not in school) with					
	No Schooling	Primary Schooling		Secondary Schooling		Higher Schooling
		Complete	Incomplete	Complete	Incomplete	
Year = 1985						
East Asia & the Pacific	16.5	22.6	38.0	8.8	9.8	4.1
Latin America & the Caribbean	16.8	18.4	45.4	7.0	7.5	5.0
Middle East & North Africa	36.1	27.8	16.3	7.9	9.6	2.3
South Asia	48.5	16.2	17.3	6.5	9.1	2.3
Sub Saharan Africa	37.5	25.1	30.0	2.1	4.9	0.4
Year = 1990						
East Asia & the Pacific	11.6	21.2	39.3	9.9	11.7	6.1
Latin America & the Caribbean	13.5	19.9	43.6	8.2	7.9	6.8
Middle East & North Africa	26.1	36.3	12.8	8.8	12.4	2.8
South Asia	37.8	20.2	20.1	8.4	10.2	3.2
Sub Saharan Africa	29.9	30.5	29.7	2.9	6.3	0.7
Year = 1995						
East Asia & the Pacific	5.9	20.1	39.5	11.5	14.3	8.7
Latin America & the Caribbean	9.2	21.0	43.2	9.3	8.5	8.8
Middle East & North Africa	15.5	42.3	11.3	10.2	15.6	3.4
South Asia	28.3	23.5	20.0	10.2	11.3	4.2
Sub Saharan Africa	22.2	35.5	29.4	3.9	7.9	1.0

Table 8: Projections of Educational Attainment at the Regional Level: Males

Region	Proportion of population under 60 years (not in school) with			
	No schooling	Some primary schooling	Some secondary schooling	Some higher schooling
Year=2000				
East Asia and the Pacific	4.6	57.4	27.8	10.2
Latin America & the Caribbean	7.2	62.6	19.3	10.9
Middle East & North Africa	6.9	56.3	30.4	6.4
South Asia	22.6	48.5	23.9	5.0
Sub Saharan Africa	17.0	68.0	13.7	1.3
Year=2005				
East Asia and the Pacific	2.1	54.0	31.5	12.4
Latin America & the Caribbean	5.6	60.2	21.2	13.0
Middle East & North Africa	1.0	55.9	35.3	7.8
South Asia	14.8	52.5	26.7	5.9
Sub Saharan Africa	13.7	69.5	15.2	1.5
Year=2010				
East Asia and the Pacific	1.5	49.2	34.9	14.4
Latin America & the Caribbean	5.5	57.0	22.7	14.8
Middle East & North Africa	0.4	51.3	39.5	8.9
South Asia	8.4	55.5	29.3	6.8
Sub Saharan Africa	11.7	70.2	16.4	1.7
Year=2015				
East Asia and the Pacific	1.3	43.8	38.4	16.5
Latin America & the Caribbean	5.4	53.4	24.4	16.7
Middle East & North Africa	0.2	46.5	43.4	9.9
South Asia	7.8	52.5	32.1	7.6
Sub Saharan Africa	10.8	69.9	17.5	1.8
Year=2020				
East Asia and the Pacific	1.8	40.6	40.0	17.5
Latin America & the Caribbean	5.6	51.6	25.1	17.6
Middle East & North Africa	0.2	43.9	45.6	10.4
South Asia	8.1	50.2	33.7	8.0
Sub Saharan Africa	11.3	69.2	17.7	1.9

Table 9: Projections of Educational Attainment at the Regional Level: Females

Region	Proportion of population under 60 years (not in school) with			
	No schooling	Some primary schooling	Some secondary schooling	Some higher schooling
Year=2000				
East Asia and the Pacific	8.2	56.8	27.0	7.9
Latin America & the Caribbean	8.1	58.2	24.0	9.7
Middle East & North Africa	17.4	53.1	25.5	4.1
South Asia	36.5	43.4	17.1	2.9
Sub Saharan Africa	28.3	61.4	9.7	0.6
Year=2005				
East Asia and the Pacific	4.5	55.6	30.5	9.4
Latin America & the Caribbean	6.5	55.3	26.6	11.5
Middle East & North Africa	9.8	55.2	30.2	4.8
South Asia	30.3	47.5	18.9	3.3
Sub Saharan Africa	25.4	63.1	10.8	0.6
Year=2010				
East Asia and the Pacific	2.9	53.4	32.7	11.0
Latin America & the Caribbean	6.5	51.8	28.6	13.2
Middle East & North Africa	4.4	56.0	34.2	5.4
South Asia	25.1	50.7	20.5	3.6
Sub Saharan Africa	23.5	64.0	11.8	0.7
Year=2015				
East Asia and the Pacific	2.3	49.1	35.5	13.2
Latin America & the Caribbean	6.3	48.1	30.8	14.8
Middle East & North Africa	0.5	55.4	38.0	6.1
South Asia	19.7	53.8	22.5	4.0
Sub Saharan Africa	22.7	64.1	12.5	0.7
Year=2020				
East Asia and the Pacific	2.3	42.4	39.2	16.1
Latin America & the Caribbean	6.5	46.5	31.3	15.7
Middle East & North Africa	0.3	52.4	40.8	6.5
South Asia	17.3	54.0	24.3	4.4
Sub Saharan Africa	23.0	63.4	12.8	0.8

Figure 5

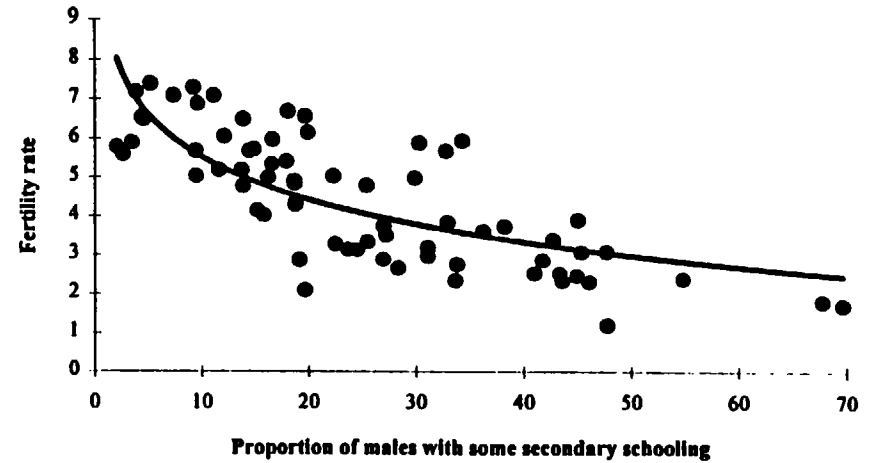
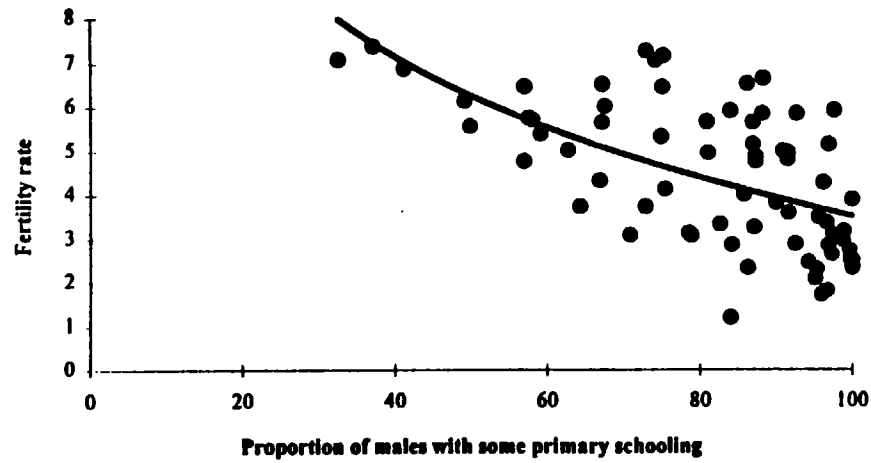
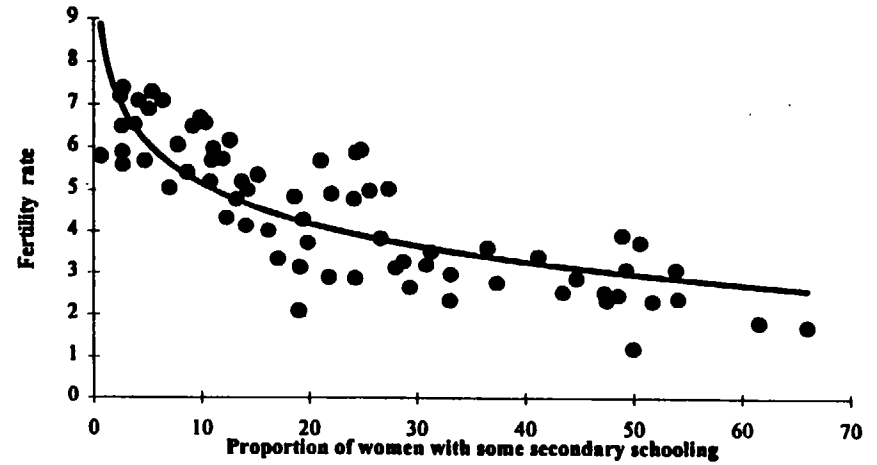
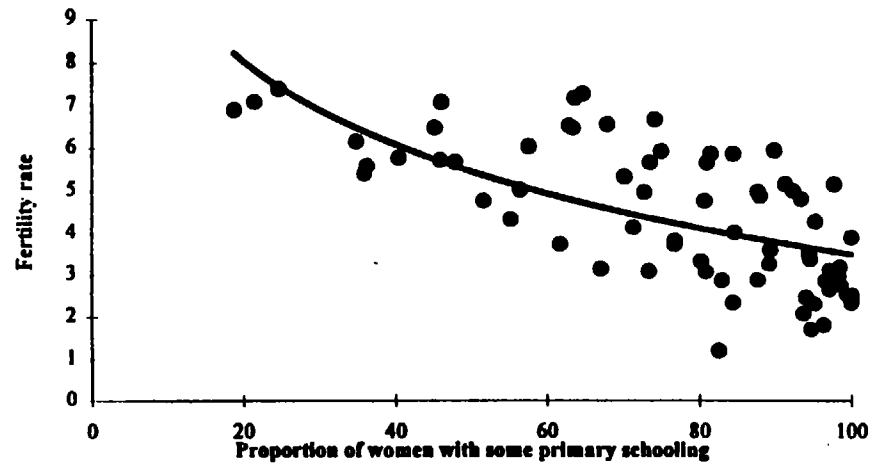


Figure 6

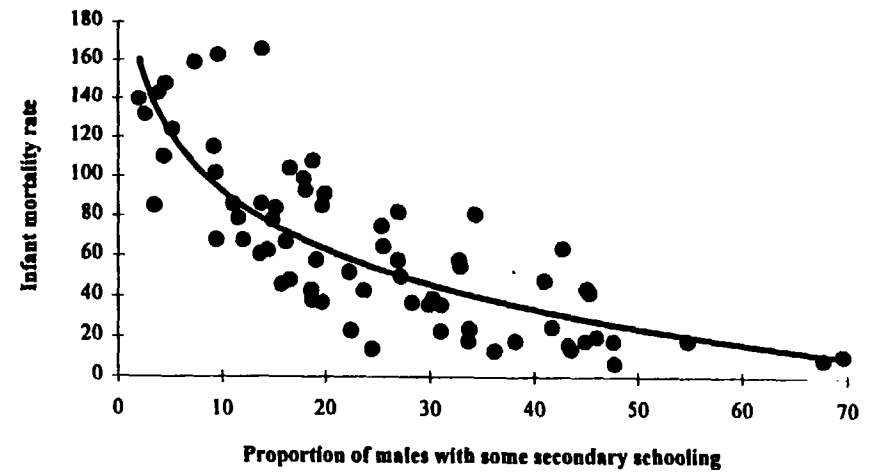
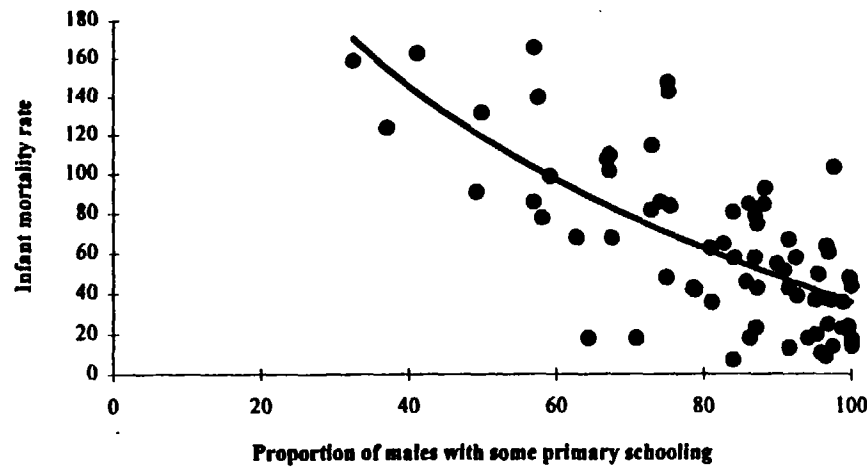
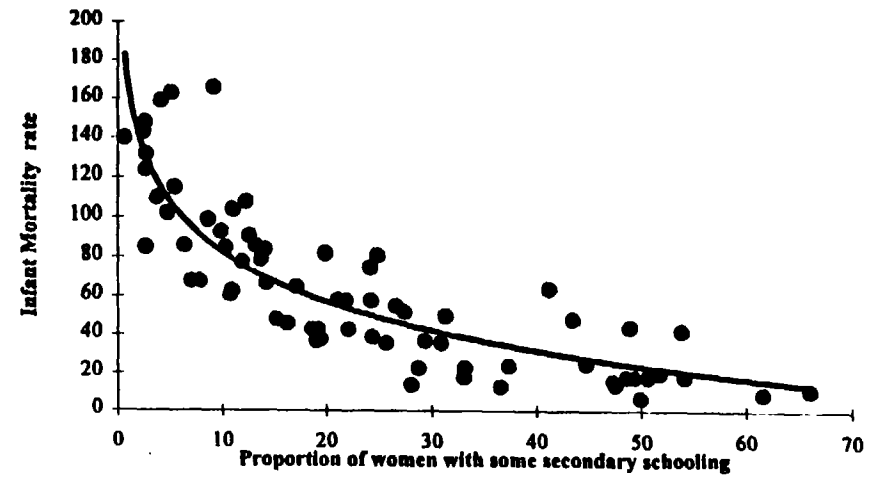
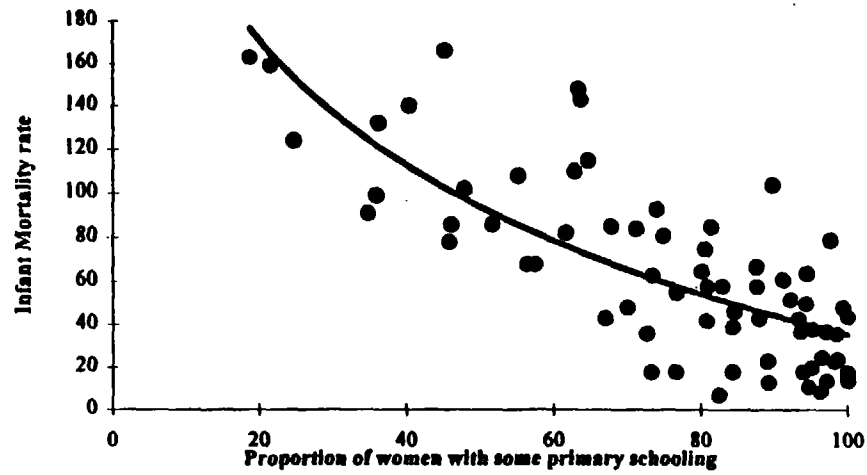
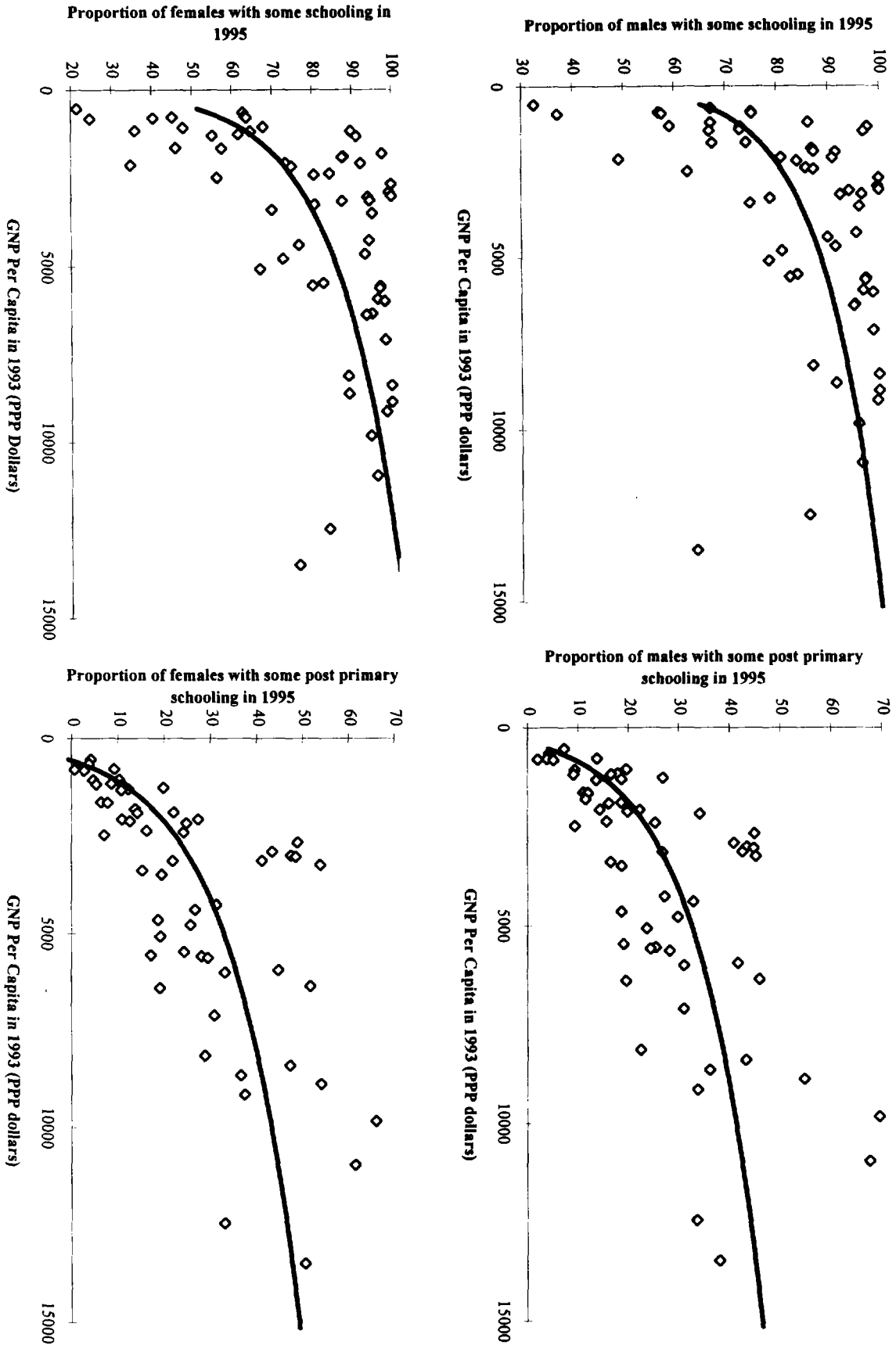


Figure 7



References

- Azariadis, Costas and Allen Drazen. 1990. "Threshold Externalities in Economic Development", *Quarterly Journal of Economics*, : 501-26
- Barro, Robert. 1991. "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, 106(2):407-443.
- Barro, Robert and Jong-Wha Lee. 1993. "International Comparison of Educational Attainment", *Journal of Monetary Economics*, 32:363-394.
- Chinese Social Statistics Publisher. 1993. *Chinese Social Statistics: 1993*, Beijing: Chinese Social Statistics Publisher.
- Chowdhary, Kowsar P. "Literacy and Primary Education", HRO Working Paper 50, The World Bank, Washington DC.
- Dubey, Ashutosh and Elizabeth King. 1994. "A New Cross-Country Education Stock Series Differentiated by Age and Sex", The World Bank, (Typescript).
- ILO (International Labor Office). 1986. *Economically Active Population Estimates and Projections: 1950-2025*, Geneva: International Labor Organization.
- Jimenez, Emmanuel. 1994. "Human and Physical Infrastructure: Public Investment and Pricing Policies in Developing Countries", Policy Research Working Paper 1281, The World Bank.
- King, Elizabeth and M. Anne Hill (eds). 1993. *Women's Education in Developing Countries*, Washington DC: The World Bank.
- Kyriacou, G. A. 1991. *Level and Growth Effects of Human Capital: A Cross-Country Study of the Convergence Hypothesis*, Department of Economics, New York University (mimeo).
- Mankiw, N.G., David Romer and David N. Weil. 1992. "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*,
- Nehru, Vikram, Eric Swanson, and Ashutosh Dubey. 1993. "A New Database on Human Capital Stock: Sources, Methodology and Results", Policy Research Working Paper 1124, The World Bank.
- Psacharopoulos, George and Ana Maria Arrigada. 1986. "The Educational Composition of the Labor Force: An International Comparison", *International Labor Review*, 125 (5):561-574.

-
- Psacharopoulos, George and Ana Maria Arrigada. 1992. "The Educational Composition of the Labor Force: An International Update", *Journal of Educational Planning and Administration*, 6 (2):141-159.
- Romer, P. M. 1989. "Human Capital and Growth: Theory and Evidence", NBER Working Paper 3173.
- Subbarao, K. and Laura Raney. 1993. "Social Gains from Female Education: A Cross National Study", World Bank Discussion Paper 194.
- UNESCO. 1984. *The Drop-out Problem in Primary Education: Some Case Studies*, Bangkok: UNESCO Regional Office for Education in Asia and the Pacific.
- UNESCO, 1993. *Trends and Projections of Enrollment Level of Education by Age and Sex: 1960-2025*, Paris: UNESCO Division of Statistics.
- World Bank. 1991. *World Development Report 1991: The Challenge of Development*, Washington DC: The World Bank.

Appendix 1 : Country coverage

Region	Countries
East Asia and the Pacific	Fiji, Hong Kong, Indonesia, Korea, Myanmar, Malaysia, Philippines, Papua New Guinea, Thailand
China	China
Latin America and the Caribbean	Argentina, Barbados, Bolivia, Brazil, Colombia, Chile, Costa Rica, Dominican Republic, Ecuador, Guatemala, Guyana, Honduras, Haiti, Jamaica, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Trinidad & Tobago, Uruguay, Venezuela
Middle East & North Africa	Bahrain, Algeria, Iran, Iraq, Kuwait, Syria, Tunisia
South Asia	Afghanistan, Bangladesh, India, Sri Lanka, Nepal, Pakistan
Sub Saharan Africa	Benin, Botswana, Central African Republic, Cameroon, Ghana, Gambia, Guinea Bissau, Kenya, Lesotho, Mali, Mozambique, Mauritius, Malawi, Niger, Rwanda, Sudan, Senegal, Sierra Leone, Togo, Tanzania, Uganda, Zaire, Zambia, Zimbabwe
ECA	Turkey

Appendix 2: Availability of data on repeat rates

Country	Years for which data on repeaters is available	
	Primary	Secondary
Afghanistan	1977-85	1977-85
Argentina	1970-76	1970-75
Bangladesh	1976-89	-
Bahrain	1981-92	1981-92
Bolivia	1990	1990
Brazil	1970-87	1970-87
Barbados	-	-
Botswana	1975-92	1985-92
Central African Republic	1970-89	1970-89
Chile	1970-83	1975-83
China	1988-93	1989-93
Cameroon	1975-90	1975-90
Colombia	1970-92	1970-92
Costa Rica	1970-93	1980-92
Dominican Republic	1970-80	-
Ecuador	1970-87	1970-84
Fiji	1976-86	1977-86
Ghana	1970-91	1970-91
Gambia	1975-91	1975-91
Guinea Bissau	1975-87	1975-86
Guatemala	1970-86	1975-80
Guyana	1970-86	1970-83
Hong Kong	1979-84	1979-84
Honduras	1980-91	1991
Haiti	1978-90	1978-90
Indonesia	1975-92	1975-92
India	1970-87	1983
Iran	1983-92	1983-92
Iraq	1970-92	1970-92
Jamaica	1975-90	1975-90
Kenya	1970-81	-
Korea	1970	1970
Kuwait	1970-93	1975-93
Sri Lanka	1970-92	1970-92
Lesotho	1975-92	1986-87
Mexico	1975-92	1976-92
Mali	1970-93	1970-93
Myanmar	1970	1970
Mozambique	1981-92	1982-92
		contd...

Malawi	1975-92	1987
Malaysia	-	-
Niger	1970-90	1970-90
Nicaragua	1970-92	1979-92
Nepal	1988-92	1988-92
Pakistan	-	-
Panama	1970-89	1975-88
Peru	1875-85	1975-85
Philippines	1980-89	1989
Papua New Guinea	-	-
Paraguay	1970-92	-
Rwanda	1970-91	1981-91
Sudan	1970	1970
Senegal	1970-91	1978-91
Sierra Leone	1977-82	1977
El Salvador	1975-92	1975-89
Syria	1970-93	1970-93
Togo	1970-90	1970-90
Thailand	1975-88	1975-77
Trinidad and Tobago	1981-91	1984-97
Tunisia	1970-93	1975-93
Turkey	1983	1983
Tanzania	1975-93	-
Uganda	1975-86	1976
Uruguay	1970-92	1975-92
Venezuela	1970-92	1975-92
Zaire	1970-92	1975-92
Zambia	1975-86	1976-84
Zimbabwe	1984	1984

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